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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
| 10/516,742 | 12/06/2004 | Suk Hun Lee | 3449-0407PUS1 | 6987 |
| 2292 7590 03/23/2007 BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747 | | | EXAMINER LEE, CHEUNG | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2812 | |
| SHORTENED STATUTORY PERIOD OF RESPONSE | | NOTIFICATION DATE | DELIVERY MODE | |
| 3 MONTHS | | 03/23/2007 | ELECTRONIC | |

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 03/23/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

| | | | |
|------------------------------|-----------------|--------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/516,742 | LEE, SUK HUN | |
| | Examiner | Art Unit | |
| | Cheung Lee | 2812 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 December 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 10 and 11 is/are rejected.
- 7) ☒ Claim(s) 8, 9 and 12-15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

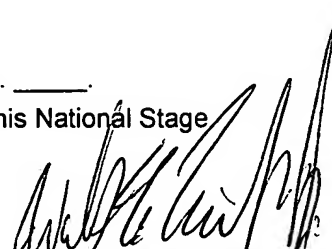
Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.


WALTER LINDSAY JR.
PRIMARY EXAMINER

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Notice to Applicant

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 10, 2007 has been entered.

Response to Amendment

2. In view of applicant's amendments and arguments filed on December 7, 2006, the rejections of claims 1-7, 10 and 11 under 35 U.S.C. 102(e) or 103(a) as stated in the Office Action mailed on October 10, 2006 have been withdrawn. Applicant's arguments have been rendered moot in view of the new or modified ground of rejection given below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2812

3. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahama et al. (US Pat. 6172382; hereinafter "Nagahama") in view of Shakuda (US Pub. 2002/0125492).

4. Referring to figures 1-9 and related text, Nagahama discloses [Re claims 1 and 7] a method for fabricating a nitride semiconductor, the method comprising the step of: (a) growing a GaN-based buffer layer (11, 112) formed on a substrate 10 in any one selected from a group consisting of a three layered structure $Al_yIn_xGa_{1-(x+y)}N/In_xGa_{1-x}N/GaN$ where $0 < x \leq 1$ and $0 \leq y \leq 1$, a two-layered structure $In_xGa_{1-x}N/GaN$ where $0 < x \leq 1$ (col. 19, lines 9-37), and a superlattice structure of $In_xGa_{1-x}N/GaN$ where $0 < x \leq 1$, Nagahama discloses InGaN as a first buffer layer 11/GaN as a second buffer layer 112, so the claimed limitation is met; and (b) growing a GaN-based layer 14 on the grown GaN-based buffer layer (see fig. 2), but Nagahama fails to disclose expressly wherein the GaN-based layer on the buffer layer is single crystalline layer.

Referring to figures 1(a)-6 and related text, Shakuda discloses a single-crystal GaN type compound semiconductor layers including an n-type cladding layer 25 (page 3, paragraph 39). The n-type cladding layer comprises AlGaN (col. 5, paragraph 83).

Nagahama also discloses AlGaN as an n-side cladding layer 14 (col. 21, lines 15-35), and the second buffer layer 112 is made of a single crystal nitride semiconductor (col. 19, lines 17-20).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use GaN-based single-crystalline layer, as taught by Shakuda, because

Art Unit: 2812

it would have been to prevent undesirable lattice defect and dislocation (Shakuda, page 2, paragraph 27).

5. Claims 2-3 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahama in view of Shakuda, as applied above, and further in view of Kano et al. (US Pub. 2001/0035531; hereinafter "Kano").

6. [Re claims 2 and 10] The combined teaching of Nagahama and Shakuda fails to disclose expressly wherein the step (b) comprises the step of: growing an indium-doped GaN layer; growing an undoped GaN layer on the indium-doped GaN layer; and growing a silicon-doped n-GaN layer on the undoped GaN layer.

Referring to figures 1-11 and related text, Kano discloses an InGaN/AlGaIn layer 50; an undoped GaN layer 6 (page 6, paragraph 87) formed on the InGaN/AlGaIn layer; and a silicon-doped n-GaN layer 7 (page 7, paragraph 97, Table 2) formed on the undoped GaN layer.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use doped and undoped layers before n-GaN layer, as taught by Kano, because it would have been to reduce lattice defects and to improve crystallinity (Kano, page 3, paragraph 42).

7. [Re claims 3 and 11] The combined teaching of Nagahama and Shakuda fails to disclose expressly wherein the step (b) comprises the step of: growing an undoped GaN layer; growing an indium-doped GaN layer on the undoped GaN layer; and growing a silicon-doped n-GaN layer on the indium-doped GaN layer.

Art Unit: 2812

Referring to figures 1-11 and related text, Kano discloses an undoped GaN layer 3; an InGaN/AlGaN layer 30 formed on the undoped GaN layer; and a silicon-doped n-GaN layer 7 (page 7, paragraph 97, Table 2) formed on the indium-doped GaN layer. The motivation stated in claims 2 and 10 also applies.

8. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doverspike et al. (US Pat. 6459100; hereinafter "Doverspike") in view of Nagahama.

9. Referring to figure 1 and related text, Doverspike discloses [Re claim 4] a nitride semiconductor light emitting device comprising: a substrate 11; a GaN-based buffer layer 13 formed on the substrate; a first electrode layer of an n-GaN layer 20 formed on the GaN-based buffer layer, the silicon-doped n-GaN layer (col. 5, lines 50-55) is first electrode layer as disclosed in the specification; an activation layer 12 formed on the first electrode layer; and a second electrode layer of a p-GaN layer 23 formed on the activation layer, the Mg-doped p-GaN layer (col. 5, lines 55-65) is second electrode layer as disclosed in the specification. However, Doverspike fails to disclose expressly wherein the GaN-based buffer layer formed on the substrate in any one selected from a group consisting of a three layered structure $\text{Al}_y\text{In}_x\text{Ga}_{1-(x+y)}\text{N}/\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$ where $0 < x \leq 1$ and $0 \leq y \leq 1$, a two-layered structure $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$ where $0 < x \leq 1$, and a superlattice structure of $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$ where $0 < x \leq 1$.

Referring to figures 1-9 and related text, Nagahama discloses InGaN as a first buffer layer 11/GaN as a second buffer layer 112 (col. 19, lines 9-37).

Art Unit: 2812

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the buffer structure, as taught by Nagahama, because it would have been to relax the lattice constant mismatch (Nagahama, col. 19, lines 10-15).

10. Doverspike discloses [Re claim 5] wherein further comprising: an Indium-doped GaN layer 12 formed on the GaN-based buffer layer; and an undoped GaN layer 15 formed on the Indium-doped GaN layer (see fig. 1).

11. Doverspike discloses [Re claim 6] wherein further comprising: an undoped GaN layer 14 formed on the GaN-based buffer layer; and an Indium-doped GaN layer 12 formed on the undoped GaN layer (see fig. 1).

Allowable Subject Matter

12. Claims 8, 12 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The statement of reasons for the indication of allowable subject matter was given in the Office Action mailed on October 10, 2006.

Claims 9 depends from claim 8, claim 13 depends from claim 12 and claim 15 depends from claim 14, so they are objected for the same reason.

Conclusion

Art Unit: 2812

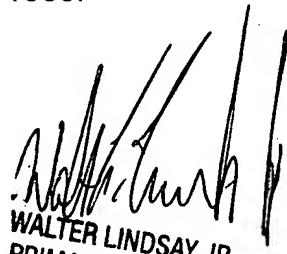
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cheung Lee whose telephone number is 571-272-5977. The examiner can normally be reached on Monday through Friday from 8:30AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Cheung Lee

March 16, 2007



WALTER LINDSAY JR.
PRIMARY EXAMINER